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Attorney Docket No.: 033082M177 PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Confirmation No.: 3772

In re Appellants	:	Jun Takeuchi, et al.
U.S. Serial No.	:	10/663,793
Filed	:	September 17, 2003
Examiner	:	Katherine A. Bareford
Group Art Unit	:	1762
For	:	METHOD FOR COATING INTERNAL MEMBER HAVING HOLES IN VACUUM PROCESSING APPARATUS AND THE INTERNAL MEMBER HAVING HOLES COATED BY USING THE COATING METHOD

APPEAL BRIEF

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Appeal Brief – Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I. REAL PARTY IN INTEREST

The present application is assigned to TOKYO ELECTRON LIMITED, a corporation of Japan having a place of business at 3-6, Akasaka 5-Chome, Minato-Ku, Tokyo-To, JAPAN.

II. RELATED APPEALS AND INTERFERENCES

To the best of the undersigned's knowledge, no other appeals or interferences will directly affect, will be directly affected by, or will have a bearing on, the Board's decision in this appeal.

III. STATUS OF CLAIMS

Claims 1-4 remain pending in the application, and are under appeal. These claims are attached to this Brief, as required by 37 CFR 1.192(c)(9). Claims 5-8 were withdrawn as being directed to a non-elected invention.

IV. STATUS OF AMENDMENTS

An Amendment was filed on April 11, 2007. It was corrected and resubmitted on May 15, 2007. The Amendment was entered. A Final Rejection was mailed on June 15, 2007.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Claim 1 is directed to a coating method for forming a coating film of ceramic material on a surface of an internal member disposed in a vacuum processing apparatus. The internal member has holes formed in the surface thereof (see, e.g., page 1, lines 1-4, and page 4, lines 18-20). The method involves three steps, i.e., steps (A), (B) and (C) (see, e.g., page 4, line 32 - page 5, line 8).

Step (A) of the method of claim 1 involves filling the holes of the internal member with padding plugs (see, e.g., page 4, lines 33-34). Each of the padding plugs has a core member made from a metal material and a metal-resin composite layer covering the circumferential surface of the core member (see, e.g., page 4, line 35 – page 5, line 1). The metal-resin composite layer is a complex consisting of a metal material and a resinous material exhibiting a non-conjugative property with respect to the coating film (see, e.g., page 5, lines 2-4).

Step (B) of the method of claim 1 involves forming a ceramic coating film on the surface of the internal member by means of plasma spraying (see, e.g., page 5, lines 4-6).

In step (C) of the method of claim 1, the padding plugs are extracted out of the holes of the internal member (see, e.g., page 5, lines 6-8).

Claim 2 limits the method of claim 1 as follows:

- the surface of the internal member having holes is composed of a material selected from a group of aluminum and aluminum base alloys (see, e.g., page 5, lines 10-12);

- each of the holes has an inner diameter ranging from 0.3 mm to 5.0 mm (see, e.g., page 5, lines 12-14);
- the core member of the padding plug is formed by a steel wire (see, e.g., page 5, lines 14-15);
- the metal-resin composite layer of the padding plug is composed of an electroless nickel plating layer ranging from 10 to 50 μm in thickness and having fluoropolymer particles dispersed therein (see, e.g., page 5, lines 10-12);
- the coating film is composed of a material selected from a group of Al_2O_3, AlN, TiO_2 and Y_2O_3 (see, e.g., page 5, lines 19-20); and
- in step (A), the padding plugs are fitted in the holes so as to project from the surface of the internal member by 1 mm to 3 mm (see, e.g., page 5, lines 21-23).

Claim 3 is directed to a coating method for forming a first coating film providing an insulating layer and a second coating film providing an electrode layer embedded in the insulating layer on a base part of an electrostatic chuck (see, e.g., page 5, lines 24-29). The electrostatic chuck is an internal member disposed in a vacuum processing apparatus and has gas injection holes formed on the surface thereof. The method involves three steps, i.e., steps (D), (E) and (F) (see, e.g., page 5, line 32 – page 6, line 12).

In step (D) of the method of claim 3, a first insulating layer composed of a coating film of Al_2O_3 is formed on the surface of the base part of the electrostatic chuck by using the coating method as defined in claim 1 (see, e.g., page 5, lines 32-35).

Step (E) of the method of claim 3 involves process sub-steps (a)-(d). In sub-step (a), the gas injection holes of the base part are filled with padding plugs made of a metal material. Sub-step (b) involves forming a tungsten coating film on the surface of the first insulating layer by means of plasma spraying. Sub-step (c) involves extracting the padding plugs out of the gas

injection holes of the base part of the electrostatic chuck and forming the electrode layer arranged on the first insulating layer. See, e.g., page 5, line 35 – page 6, line 9.

Step (F) of the method of claim 3 involves forming a second insulating layer composed of a coating film of Al_2O_3 on the surface of the electrode layer by using the coating method as defined in claim 1 (see, e.g., page 6, lines 9-12).

Claim 4 limits the method of claim 3 as follows:

- the surface of the internal member having holes is composed of a material selected from a group of aluminum and aluminum base alloys (see, e.g., page 6, lines 13-17);
- each of the holes has an inner diameter ranging from 0.3 mm to 5.0 mm (see, e.g., page 6, lines 17-18);
- the core member of the padding plug is formed by a steel wire (see, e.g., page 6, lines 18-19);
- the metal-resin composite layer of the padding plug is composed of an electroless nickel plating layer ranging from 10 to 50 μm in thickness and having fluoropolymer particles dispersed therein (see, e.g., page 6, lines 19-23);
- the coating film is composed of a material selected from a group of Al_2O_3, AlN, TiO_2 and Y_2O_3; (see, e.g., page 6, lines 23-25); and
- in step (A), the padding plugs are fitted in the holes so as to project from the surface of the internal member by 1 mm to 3 mm (see, e.g., page 6, lines 25-27).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The following issues are presented for consideration in this appeal:

1) Whether claim 1 is unpatentable under 35 U.S.C. §103(a) as being unpatentable in view of the "admitted state of the prior art" (pages 1-4 of the specification) taken with U.S. Patent Application Publication No. 2003/0154919 to Rice et al. ("Rice") and Japan 05-278038 ("JP '308"); and

2) Whether claims 2-4 are unpatentable under U.S.C. §103(a) as being unpatentable in view of the "admitted prior art" taken with Rice and further taken with WO 01/54188 ("WO '188"), U.S. Patent No. 4,115,507 to Pico, deceased, et al. ("Pico") and U.S. Patent No. 5,634,266 to Sherstinsky et al. ("Sherstinsky").

VII. ARGUMENTS

A. CLAIM 1 WOULD NOT HAVE BEEN OBVIOUS IN VIEW OF THE "ADMITTED STATE OF THE PRIOR ART" TAKEN WITH RICE AND JP '308

According to the Final Office Action, the "admitted state of the prior art" teaches all of the features of claim 1 except for the use of the metal padding plug coated with a metal-resin composite layer and the removal of the padding plugs after coating. JP '038 is cited in the Office Action for teaching that a desirable mold release coating for a material such as steel is provided by electrolessly plating the mold with a nickel containing 5-25 volume percent of polytetrafluoroethylene (PTFE), producing a composite of nickel metal and PTFE resin (see Abstract). Rice is cited in part for teaching the use of a masking apparatus in a thermal spray process. Rice is also cited for disclosing the use of a cup 62 as a mask, wherein the cup can be made of thin sheet metal (e.g., aluminum or steel) and can withstand the temperature of droplets from the thermal spray device. In addition, Rice is cited for teaching that the cup 62 can be provided with a coating to reduce the adherence of thermal spray droplets, wherein the coating can be, e.g., Teflon® or a mold release coating.

The Final Office Action states that it would have been obvious to modify the "admitted state of the prior art" to use metal padding plugs that have been coated with a nickel-PTFE release coating to mask the gas holes during coating, as suggested by JP '038 and Rice, in order to provide a metal padding plug that does not stick to the coating material.

For at least the reasons given below, Appellants respectfully submit that claim 1 would not have been obvious in view of the "admitted state of the prior art" taken with JP '038 and Rice.

1. The Rejection of Claim 1 Untenably Is Based Upon Improper Hindsight Because Neither JP '038 nor Rice Could Have Supplied the Motivation Necessary to Support Their Asserted Combination with the Admitted Prior Art

Applicants' step (B) requires "plasma spraying" to form the ceramic coating film. Plasma spraying inherently involves spraying ceramic particles that are at a high temperature and that are at a high kinetic energy against the surface of Applicants' hole-masking padding plugs. Such plasma spraying attacks the surface of the plugs. Therefore, in step (A), Applicants require hole-filling with particular padding plugs that (1) do not melt under high temperature, (2) do not permit the sprayed layer to bind strongly to them, and (3) do not apply thermal stress to the sprayed layer. The Examiner concedes that the "admitted prior art" lacks Applicants' provision of their recited padding plugs. Applicants' requirements for such plugs, and Applicants' claimed steps of using them, would not have been suggested by JP '038 or Rice.

While Applicants are concerned with <u>protection</u> of the coated member holes from the plasma spray, JP '038 is concerned with finding a good <u>demolding</u> compound. JP '038 teaches that a PTFE-containing Ni-P plating improves the <u>releasability of a rubber</u> product formed in the mold. It does not teach anything concerning the applicability of a PTFE-containing Ni-P plating to surface coating with a plasma sprayed ceramic. It therefore cannot suggest any special type of hole-masking padding plugs for such surface coating. The differences between methods of rubber molding, as in JP '038, and methods of hole-masking for plasma ceramic spraying, as in Applicants' disclosure, are so great that one of ordinary skill in the art simply would not have looked to JP '038 for assistance in plasma ceramic spraying. Such person would not have applied PTFE-containing Ni-P plating, as taught in JP '038, as the metal-resin composite required in Applicants' claim 1.

Cup 62 in Rice is not a padding plug inserted into, or filling up a hole. Rather, cup 62 is in the form of a tray for receiving thermal spray droplets below the sprayed area. Cup 62 is <u>located near</u> the end portion of the spray target so as <u>to receive</u> the <u>oversprayed droplets</u>. Because of its taught location, cup 62 in Rice is <u>not</u> exposed to the far more severe conditions that Applicants' recited padding plugs are exposed to during plasma spraying. In Applicants' method, plasma spray is jetted directly to the internal member and padding plugs, while cup 62

in Rice merely receives oversprayed droplets. Moreover, damage to Applicants' padding plugs is impermissible because they must securely mask each hole in the internal member whereas some degree of damage to the cup 62 is permissible.

Thus, for at least these reasons, Appellants submit that one of ordinary skill in the art would not have been motivated by JP '038 and/or Rice to use Applicants' padding plugs in the admitted prior art arrangements. Applicants' provided plugs must resist high temperatures, resist binding to ceramic, and must avoid thermally stressing sprayed ceramic.

2. Neither JP '038 Nor Rice Suggests a Metal-Resin Composite Layer Exhibiting Non-Conjugative Properties Relative to Thermally-Sprayed Metal Coating

Claim 1 requires that padding plug's "metal-resin composite layer" be a complex "exhibiting non-conjugative property to the coating." At page 3, lines 23-31 in the specification, Applicants discuss the failure of conventional methods to preclude conjugation between metal padding plugs and ceramic spray. They observed:

> [i]f the padding plugs are made of a metal material, they are not molten by heat of plasma spraying. However, it is noted that coating material conjugates to the metal material of the padding plugs disadvantageously. Even if it is desired to extract the padding plugs after the coating process, they could not be extracted with ease since they are welded to the coating film. High-handed extraction would cause the coating film to be peeled or cracked.

In their specification, they give the specific example of how a ceramic coating film such as Al_2O_3 (see, e.g., page 2, line 8), <u>conjugates</u> to metal padding plugs disadvantageously. Their claim 1 thus limits their metal-resin composite layer to a complex consisting of a metal material and a resinous material exhibiting <u>non-conjugative property</u> to the <u>ceramic</u> coating film.

JP '038 does not teach applying a ceramic coating film onto the PTFE-containing Ni-P plating disposed on the metallic mold. Rather, JP '038 teaches that the PTFE-containing Ni-P plating improves the releasability of a <u>rubber</u> product formed <u>in the mold</u>. Thus, JP '038 teaches only that the PTFE-containing Ni-P plating is non-conjugative relative to <u>rubber</u>, not relative to

ceramic material. As such, JP '038 could not have taught or suggested, to one of ordinary skill in the art, the use of a plating that is assured to be non-conjugative relative to a ceramic coating.

Rice teaches that cup 62 is made from

> a resilient, compressible or compliable material such as thin sheet metal including aluminum or steel, a polymer such as silicone or a Santoprene® synthetic elastomer from Monsanto Co., a composite material such as a reinforced polymer or a composite aluminum foil laminated to a fiberglass cloth or another polymer. Alternatively, any material that returns to its original shape after being deformed or squeezed by fingers 98 and can withstand the temperature of the droplets from thermal spray device 40 is believed suitable for practicing the invention. (paragraph [0040]).

In the Final Office Action, Rice is cited in part for teaching that the cup can be further supplied with a coating, such as Teflon® or a mold release coating, to reduce the adherence of thermal spray droplets (paragraph [0044]). However, Rice does not teach a separate coating that is a metal-resin composite layer. Thus, the mold release agent in Rice, which is used for a plastic molding die, is not formed of a metal-resin composite with non-conjugative properties with respect to ceramic coating. Further, the Rice Teflon® coating is used as an adhesion-promoting agent under only relatively mild conditions. Further still, while Rice comments that the deposition of a metal or ceramic coating to a part using a thermal spraying process is well known (paragraph [0002]), this is the only mention Rice makes of a ceramic coating. Beyond this, Rice does not mention ceramic materials, and therefore Rice does not teach the use of a ceramic coating material in connection with masking cup 62 or any other surface. Rice simply does not teach or suggest Applicants' use of a metal-resin composite layer with non-conjugative properties relative to a sprayed ceramics coating.

Thus for at least these reasons, neither JP '038 nor Rice would have suggested to one of ordinary skill in the art to use a metal-resin composite, with a non-conjugative property relative to a ceramic coating, in a ceramic coating method. Neither JP '038 nor Rice can remedy the deficiencies of the admitted prior art with respect to Applicants' claim 1. Therefore, the rejection must be reversed.

B. CLAIMS 2-4 WOULD NOT HAVE BEEN OBVIOUS IN VIEW OF THE "ADMITTED PRIOR ART" TAKEN WITH RICE AND FURTHER TAKEN WITH WO '188, PICO AND SHERSTINSKY

WO '188/Harada[1] is cited for teaching that it is known to provide an electrostatic chuck member with layers of an insulating material of oxide ceramic, such as aluminum oxide, with an electrode layer applied between the aluminum oxide layers (paragraphs [0026]-[0027]). The chuck substrate surface material can be aluminum (paragraph [0052]). A layer of nickel-aluminum alloy can be applied to that surface, providing an aluminum alloy surface contacting the insulating layers. An aluminum oxide layer can be plasma sprayed over the aluminum and aluminum alloy surface. A tungsten electrode layer is then plasma sprayed over the aluminum oxide layer. Then another aluminum oxide layer is plasma sprayed over the tungsten layer. See paragraph [0052].

Pico is cited for teaching the use of a masking plug to prevent coating areas of a substrate with perforations or holes, with the plugs inserted into the perforations (see column 4, lines 50-55 and col. 1, lines 25-35). The plugs extend past the substrate surface by a distance which is desirably at least twice the thickness of the coating to be applied. This is said to facilitate removal of the plugs after coating (see col. 4, lines 55-65). The plugs can be metal and can be coated with a release agent to help prevent the coating from sticking (col. 5, lines 1-15).

Sherstinsky is cited for teaching that when providing electrostatic chucks with gas injection holes, the holes can desirably be, e.g., 0.5 mm (col. 5, line 60 through col. 6, line 10).

For the reasons given in Part A of this appeal brief, claim 1 would not have been obvious over the "admitted state of the prior art" in view of JP '038 and Rice. The WO '188, Pico and Sherstinsky disclosures do not cure the failure of the "admitted state of the prior art" in view of Rice and JP '038 to teach the features of claim 1. None of WO '188, Pico or Sherstinsky provides the motivation to modify the "admitted state of the prior art" with the alleged teachings

[1] Because WO '188 is in Japanese, the Examiner has used the corresponding U.S. national stage application, i.e., U.S. Application Publication No. 2003/0007308 to Harada et al. ("Harada"), as the English-language translation. Column and line references are to Harada.

of JP '038 or Rice. None of WO '188, Pico, or Sherstinsky remedies the steps missing from the admitted prior art, JP '038 and Rice in Applicants' claim 1. Claim 2 depends upon claim 1 and, therefore, includes the features recited therein. Claim 3 is an independent claim but recites the use of the coating method of instant claim 1. Claim 4 depends upon claim 3. Thus, claims 2-4 all include the features of claim 1. Therefore claims 2-4 also are patentable over the "admitted state of the prior art" in view of JP '038, Rice, WO '188, Pico and Sherstinsky, for the same reasons that claim 1 is patentable over this asserted combination.

For at least these reasons then, Appellants respectfully submit that claims 2-4 would not have been obvious over the "admitted state of the prior art" in view of Rice and JP '038 as applied to claim 1, and further in view of WO '188, Pico and Sherstinsky. This rejection also should be reversed.

* * * * * *

For the reasons set forth above, Appellants respectfully request that the rejections under 35 U.S.C. §103(a) be reversed.

If any additional fees under 37 C.F.R. §§ 1.16 or 1.17 are due in connection with this filing, please charge the fees to Deposit Account No. 02-4300, Order No. 033082M177.

Respectfully submitted,
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MAM/cvj

VIII. APPENDIX

Pursuant to 37 CFR 1.192(c)(9), herein is a clean copy of claims 1-4, the claims involved in this appeal.

Claim 1 (Previously Presented): A coating method for forming a coating film of ceramic material on a surface of an internal member disposed in a vacuum processing apparatus, the internal member having holes formed on the surface, the method comprising:

a step (A) of filling the holes of the internal member with padding plugs each of which has a core member made from a metal material and a metal-resin composite layer covering the circumferential surface of the core member, the metal-resin composite layer being a complex consisting of a metal material and a resinous material exhibiting nonconjugative property to the coating film;

a step (B) of forming a ceramic coating film on the surface of the internal member by means of plasma spraying after the step (A); and

a step (C) of extracting the padding plugs out of the holes of the internal member after the step (B).

Claim 2 (Original): A coating method according to claim 1, wherein the surface of the internal member having holes is composed of a material selected from a group of aluminum and aluminum base alloys; each of the holes has an inner diameter ranging from 0.3 mm to 5.0 mm; the core member of the padding plug is formed by a steel wire; the metal-resin composite layer of the padding plug is composed of an electroless nickel plating layer ranging from 10 to 50 μm in thickness and having fluoropolymer particles dispersed therein; the coating film is composed of a material selected from a group of Al_2O_3, AlN, TiO_2 and Y_2O_3; and at the step (A), the padding plugs are fitted in the holes so as to project from the surface of the internal member by 1 mm to 3 mm.

Claim 3 (Previously Presented): A coating method for forming a first coating film providing an insulating layer and a second coating film providing an electrode layer embedded in the insulating layer on a base part of an electrostatic chuck as an internal member disposed in a vacuum processing apparatus and having gas injection holes formed on the surface thereof, the method comprising:

a step (D) of forming a first insulating layer composed of a coating film of Al_2O_3 on the surface of the base part of the electrostatic chuck by using the coating method as defined in claim 1;

a step (E) including: a series of: a process (a) of filling the gas injection holes of the base part with padding plugs made of a metal material; a process (b) of forming a tungsten coating film on the surface of the first insulating layer by means of plasma spraying after the process (a); and a process (c) of extracting the padding plugs out of the gas injection holes of the base part of the electrostatic chuck after the process (b); and forming the electrode layer arranged on the first insulating layer; and

a step (F) of forming a second insulating layer composed of a coating film of Al_2O_3 on the surface of the electrode layer by using the coating method as defined in claim 1.

Claim 4 (Original): A coating method according to claim 3, wherein the surface of the internal member having holes is composed of a material selected from a group of aluminum and aluminum base alloys; each of the holes has an inner diameter ranging from 0.3 mm to 5.0 mm; the core member of the padding plug is formed by a steel wire; the metal-resin composite layer of the padding plug is composed of an electroless nickel plating layer ranging from 10 to 50 μm in thickness and having fluoropolymer particles dispersed therein; the coating film is composed of a material selected from a group of Al_2O_3, AlN, TiO_2 and Y_2O_3; and at the step (A), the padding plugs are fitted in the holes so as to project from the surface of the internal member by 1 mm to 3 mm.

IX. EVIDENCE APPENDIX

No declarations or affidavits under 37 CFR 1.130, 1.131 or 1.132 were submitted.

X. RELATED PROCEEDINGS APPENDIX

There have been no decisions rendered in any related appeals or interferences.